REMARKS

This amendment is responsive to the Office Action mailed November 23, 2006. Reconsideration and allowance of claims 1-17, 19-26, and 29 as set forth herein is earnestly requested.

The Status of the Claims

Claims 1-28 stand rejected under 35 U.S.C. § 102(b) as being allegedly anticipated by Schenck, U.S. Patent No. 5,561,371 (hereinafter "Schenck").

Schenck

Schenck describes a transverse gradient assembly designed by folding every coil turn on a primary coil onto a secondary coil surface. This creates a configuration in which the primary coil is made up of a plurality of half-turns or half-loops (57), and the secondary or shield coil is made up of a corresponding plurality of half-loops (59). Each half-loop of the primary is connected with a corresponding half-loop of the secondary by connecting conductors (55) disposed on a conical section surface (65) extending between the primary and secondary coil surfaces (61, 63), as best seen in Fig. 7.

In an alternative embodiment shown in FIGURE 8, the two smallest, innermost half-loops of the primary coil have mating half loops that are disposed only on the connecting surface (65), as they are too short to reach the secondary coil surface (63).

The genesis of Schenck's coil is described at col. 4 lines 4-11. Schnenck started with a conventional fingerprint primary coil (best seen in Figs. 2 and 3) and concluded that the return half-loop paths of region (33) of the fingerprint primary coil contribute no useful imaging gradient. Accordingly, Schnenck re-designed the coil by folding the primary coil along the lines B-B and B'-B' so that the non-contributing half-loops of the region (33) define a shield coil. See col. 5 line 62-col. 6 line 12.

The design of Schenck requires that the primary and secondary coils each be comprised of half-loops, and that further each half-loop of the secondary coil is connected with a half-loop of the primary coil by connecting conductors (55). Moreover, every primary coil half-loop is connected with connecting conductors (55).

Neither the primary coil nor the secondary coil include any isolated primary coil turns. Neither the primary coil nor the secondary coil retains a fingerprint-pattern.

The claims patentably distinguish over the references

Claim 5 has been placed into independent form including all limitations of base claim 1. Claim 5 calls for a gradient coil including a primary coil, a shield coil, and a plurality of coil jumps electrically connecting the primary and shield coils. The primary coil includes communicating primary coil turns that electrically connect with a coil jump, and isolated primary coil turns that do not electrically connect with a coil jump.

Schenck discloses primary and secondary coils each having half-turns that are connected by current conductors (i.e., coil jumps). However, in contrast to claim 5, Schenck does not disclose or fairly suggest such a configuration in which the primary coil includes isolated primary coil turns that do not electrically connect with a coil jump. There are no isolated primary coil turns in Schenck – rather, each and every primary coil turn of Schenck is actually a half-turn that connects with a coil jump on the connecting surface (65) of Schenck. Accordingly, Schenck does not anticipate claim 5.

Moreover, Schenck teaches away from claim 5. The design of Schenck is achieved by folding over the fingerprint pattern so that the primary coil consists only of half-turns. Schenck teaches against having any isolated primary coil turns by teaching that any return path included on the primary coil increases the stored energy without providing a useful imaging gradient. (Col. 4 lines 4-11). The skilled artisan, reading Schenck, would be motivated to use only half-turns in the primary coil, and would be motivated to avoid including any isolated primary coil turns.

In contrast, the present application quantitatively identifies a minimum stored energy that is achievable by including some isolated primary coil turns. This is discussed with reference to the quantity A_p which is the current density at the edge of the primary coil (application page 25 lines 19-20). Analyses in the present application show that the stored energy has a minimum at a certain value of A_p (page 26 lines 12-17; Fig. 8A). Thus, unlike Schenck, the present application recognizes an advantage, at least in terms of stored energy, to having some isolated primary coil turns so as to reduce A_p. Schenck teaches to the contrary, asserting that each and every

primary coil turn should be a half-turn that feeds into the current density at the edge of the primary coil, which will maximize the current density A_p.

Claim 19, which calls for selecting a total number of coil jumps which minimizes the stored energy of the gradient coil, has been placed into independent form. While the Office Action at page 3 notes that Schenck discloses analyses for optimizing parameters including stored energy, it does not identify any recognition in Schenck that there is a minimum energy achievable at a non-maximum value of the current density A_p at the edge of the primary coil. Schenck does not disclose or fairly suggest selecting a total number of coil jumps which minimizes the stored energy of the gradient coil. **Claim 16** also calls out this aspect, in the context of a gradient coil.

Claim 1 has been amended to call for the a primary coil to be a fingerprint-patterned primary coil. This amendment is supported in the original specification at least at page 10 lines 26-30 and Fig. 5 (note that Fig. 5 shows only a half-quadrant along the radians axis – the layout portion shown in Fig. 5 should be reflected across zero radians to obtain the full fingerprint pattern of the primary coil (16)). In contrast, the primary coil of Schenck includes only half-turns, which does not produce a fingerprint-patterned primary coil. Moreover, since Schenck teaches designing the coil by folding a conceptual fingerprint-patterned primary coil across the lines B-B and B'-B', the primary coil of Schenck inherently has only half-turns, which are not combinable to form a fingerprint pattern.

Claim 12 calls for a shielded correction coil that cooperatively adjusts a field of view over a continuous range. The Office Action does not identify such a shielded correction coil in Schenck, and Applicants find no such feature in Schenck. Accordingly, it is respectfully submitted that Schenck does not anticipate claim 12.

Similarly, **claim 13** calls for a generally cylindrical cold shield coaxially aligned with the outer cylindrical surface and having a larger cylindrical radius than the outer cylindrical surface, the cold shield carrying eddy current that produces a substantially spatially constant residual eddy current effect. Schenck does not appear to mention a cold shield, much less a cold shield as specified in claim 13.

Claim 7 calls out the gradient coil of claim 5, wherein at least some of the isolated primary coil turns are electrically interconnected to define an isolated primary sub-coil. Schenck does not disclose isolated primary coil turns, much less isolated primary coil turns interconnected to define an isolated primary sub-coil. Claim 7 further calls for a switch having at least: a first state in which the isolated primary

sub-coil is electrically connected with the communicating primary coil turns; and a second state in which the isolated primary sub-coil is electrically isolated from the communicating primary coil turns. The first and second states correspond to first and second selectable fields of view. Schenck does not mention such a switch. Accordingly, it is respectfully submitted that Schenck does not anticipate claim 7.

Claim 25 has been placed into independent form, and calls for a method for producing a magnetic field gradient in a magnet bore of a magnetic resonance imaging apparatus. An electrical current is circulated through a primary coil that defines an inner cylindrical surface. The primary coil includes a plurality of coil loops. The electrical current is circulated through a shield coil that defines an outer cylindrical surface coaxially aligned with the inner cylindrical surface and having a larger cylindrical radius than the inner cylindrical surface. The electrical current is communicated back and forth between the primary and shield coils via a plurality of non-planar coil jumps a plurality of times. At least some primary coil loops are selectively electrically isolated from the communicating of the electrical current between the primary and shield coils via the plurality of coil jumps. The selective electrical isolating defines a coil set which combined with a second shield coil provides a second selectable field of view.

The Office Action does not identify how Schenck anticipates claim 25. Applicants find no operation in Schenck corresponding to selectively electrically isolating at least some primary coil loops so as to define a coil set which combined with a second shield coil provides a second selectable field of view. Accordingly, it is respectfully submitted that Schenck does not anticipate claim 25.

For at least the foregoing reasons, it is respectfully submitted that claims 1-17 and 19-25 as set forth herein patentably distinguish over Schenck. There being no other pending rejection of these claims, Applicants respectfully request allowance of claims 1-17, 19-26, and 29 as set forth herein.

CONCLUSION

For the reasons set forth above, it is submitted that claims 1-17, 19-26, and 29 as set forth herein (all claims) distinguish patentably over the references of record and meet all statutory requirements. An early allowance of all claims is requested.

In the event the Examiner considers personal contact advantageous to the disposition of this case(s), he is requested to telephone Thomas E. Kocovsky or Robert M. Sieg at (216) 861-5582.

Respectfully submitted,

FAY, SHARPE, FAGAN,
MINNICH & McKEE, LLP

Thomas E. Kocovsky, Jr.,
Reg. No. 28,383
Robert M. Sieg
Reg. No. 54,446
1100 Superior Avenue
Seventh Floor
Cleveland, OH 44114-2579
(216) 861-5582